

October 26, 2004

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: **Docket Nos. 50-361 and 50-362**
NRC Generic Letter 2004-01 Requirements for Steam Generator
Tube Inspections
San Onofre Nuclear Generating Station, Units 2 and 3

Dear Sir or Madam:

Provided, as an enclosure to this letter, is the Southern California Edison response to NRC Generic Letter GL-2004-01, Requirements for Steam Generator Tube Inspections.

If you have any questions regarding this information, please contact Mr. Jack Rainsberry at (949) 368-7420.

Sincerely,



Enclosure

cc: B. S. Mallett, Regional Administrator, NRC Region IV
B. M. Pham, NRC Project Manager, San Onofre Units 2 and 3
C. C. Osterholtz, NRC Senior Resident Inspector, San Onofre Units 2 & 3

ENCLOSURE

Response to NRC Generic Letter 2004-01
Requirements for Steam Generator Tube Inspections

Requested Information

Within 60 days of the date of this generic letter, addressees are requested to provide the following information to the NRC:

- 1. Addressees should provide a description of the SG tube inspections performed at their plant during the last inspection. In addition, if they are not using SG tube inspection methods whose capabilities are consistent with the NRC's position, addressees should provide an assessment of how the tube inspections performed at their plant meet the inspection requirements of the TS in conjunction with Criteria IX and XI of 10 CFR Part 50, Appendix B, and corrective action taken in accordance with Appendix B, Criterion XVI. This assessment should also address whether the tube inspection practices are capable of detecting flaws of any type that may potentially be present along the length of the tube required to be inspected and that may exceed the applicable tube repair criteria.**

San Onofre Units 2 and 3 Response:

The San Onofre Unit 2 and 3 steam generators are designed and supplied by Combustion Engineering (CE). Each unit has two steam generators. The two steam generators in each unit have equipment number designations of "E-088" and "E-089." San Onofre Unit 2 entered commercial operation in August 1983. San Onofre Unit 3 entered commercial operation in March 1984.

Each San Onofre steam generator contains 9350 tubes. The tubing in the San Onofre steam generators is made from Inconel 600 and mill annealed at a high temperature (HTMA). The tubes have an outer diameter of 0.750 inches and a nominal wall thickness of 0.048 inches. Rows 1 through 18 are U-bend type tubes. In all other rows, the upper portion consists of two 90-degree bends with a horizontal span (square bends). The tubes are explosively expanded ("Explanded") the full depth of the 23 inch tubesheet.

The San Onofre steam generator design employs the use of horizontal supports (eggcrates) and vertical supports (vertical straps) to support the tubing. All tube support material is carbon steel. Eggcrates 01-07 are full supports, i.e. every tube passes through each support. Eggcrates 08-10 are partial supports, which do not extend across the entire tube bundle. A scalloped bar forms the non-peripheral edge of the partial eggcrates. All tubes are supported between the horizontal eggcrates and the vertical straps by two diagonal support straps known as batwing supports. All tubes in row 19 or greater are supported by a combination of bat wing and vertical straps. Tubes in rows 18 or less are supported by the batwing supports.

Some tubes have been repaired by sleeving at the top of the hot leg tubesheet in San Onofre Unit 2 steam generator tubes starting in 1999. Although approved for use, sleeves have not been used to date in San Onofre Unit 3. Sleeving is expected to be used for tube repair on Unit 3 in the future.

Attachment 1 provides a description of the base scope of steam generator tube inspections performed at San Onofre Units 2 and 3 during the last inspections, U2C13 and U3C13. Prior to each inspection, a degradation assessment, which includes operating experience, is performed to identify degradation mechanisms that may be present, and a technique validation assessment is performed to verify that the eddy current techniques are capable of detecting the degradation. For each tube location where degradation may be present, Attachment 1 also includes the type of probe used for the inspection.

A detailed description of the actual inspections, including the inspection scope and results, is provided in San Onofre letters "Docket No. 50-361; Special Report: Inservice Inspection of Steam Generator Tubes, Cycle 13, San Onofre Nuclear Generating Station, Unit 2," dated March 17, 2004 and "Docket No. 50-362; Special Report: Inservice Inspection of Steam Generator Tubes, Cycle 13, San Onofre Nuclear Generating Station, Unit 3," which is being prepared and is expected to be submitted before October 29, 2004.

The San Onofre Unit 2 and 3 steam generator tube inspection methods are not consistent with the NRC's position with respect to inspections performed within the tube sheet. San Onofre Units 2 and 3 used a "conservative bounding distance" of 16 inches within the tubesheet that was provided by Westinghouse by letter, dated February 21, 2004. This letter stated that a 16-inch inspection length is conservative.

WCAP-16208-P, dated October 2004, was subsequently completed by the Westinghouse Owners Group (WOG) to evaluate pull-out distance and leakage. Based on this analysis, the inspection depth is 10.4 inches. This value ensures that the tube will not burst and leakage will be within safety analysis limits. Additional leakage was accounted for in the operational assessment for the un-inspected portion of the tube sheet.

All other areas of the generator inspection are consistent with the NRC's position.

- 2. If addressees conclude that full compliance with the TS in conjunction with Criteria IX, XI and XVI of 10 CFR Part 50, Appendix B, requires corrective actions, they should discuss their proposed corrective actions (e.g., changing inspection practices consistent with the NRC's position or submitting a TS amendment request with the associated safety basis for limiting the inspections) to achieve**

full compliance. If addressees choose to change their TS, the staff has included in the attachment suggested changes to the TS definitions for a tube inspection and for plugging limits to show what may be acceptable to the staff in cases where the tubes are expanded for the full depth of the tubesheet and where the extent of the inspection in the tubesheet region is limited.

San Onofre Units 2 and 3 Response:

San Onofre Unit 2 and 3 inspection practices are not consistent with the staff's position in the GL. The current basis for the inspection depth within the tubesheet is WCAP-16208-P, dated October 2004. Based on this assessment, San Onofre Units 2 and 3 needs to inspect a depth of 10.4 inches within the tubesheet. San Onofre inspected 16 inches [minimum] during the two most recent inspections. This has been entered into San Onofre Units 2 and 3 corrective action program and a Technical Specification change will be submitted. The license change is not necessary for start up or for continued operation.

All other steam generator inspections are consistent with the staff's position in the GL.

- 3. For plants where SG tube inspections have not been or are not being performed consistent with the NRC's position on the requirements in the TS in conjunction with Criteria IX, XI, and XVI of 10 CFR Part 50, Appendix B, the licensee should submit a safety assessment (i.e., a justification for continued operation based on maintaining tube structural and leakage integrity) that addresses any differences between the licensee's inspection practices and those called for by the NRC's position. Safety assessments should be submitted for all areas of the tube required to be inspected by the TS where flaws have the potential to exist and inspection techniques capable of detecting these flaws are not being used, and should include the basis for not employing such inspection techniques. The assessment should include an evaluation of (1) whether the inspection practices rely on an acceptance standard (e.g., cracks located at least a minimum distance of x below the top of the tube sheet, even if these cracks cause complete severance of the tube) which is different from the TS acceptance standards (i.e., the tube plugging limits or repair criteria), and (2) whether the safety assessment constitutes a change to the "method of evaluation" (as defined in 10 CFR 50.59) for establishing the structural and leakage integrity of the joint. If the safety assessment constitutes a change to the method of evaluation under 10 CFR 50.59, the licensee should**

determine whether a license amendment is necessary pursuant to that regulation.

San Onofre Units 2 and 3 Response:

Attachment 2 provides a safety assessment that addresses any differences between the San Onofre Unit 2 and 3 inspection practices and those called for by the NRC's position. This assessment concludes that steam generator operability is maintained because the plant is in compliance with the program elements of NEI 97-06 Revision 1, dated January 2000.

Question 3 of the GL also requests licensees to consider whether the safety assessment, performed for those conditions where tube inspections within the tubesheet are not being performed consistent with the NRC's position, constitutes a change to the "method of evaluation" (as defined in 10CFR50.59) for establishing the structural and leakage integrity of the tube and/or tubesheet joint. In assessing this question, the GL inquires as to whether the safety assessment is redefining the ASME Section III pressure boundary and is using a different method of evaluation to demonstrate the structural and leakage integrity of the revised pressure boundary. Southern California Edison has reviewed the NRC's position and has concluded that the analysis approach does not redefine the ASME pressure boundary and is not a change in the method of evaluation per 10CFR50.59 based on the following:

1. SCE does not consider the assessment approach, or the described inspection program scope, as redefining the ASME Section III pressure boundary. The selection of NDE techniques or extent of inspection does not, by itself, define the limits of the ASME pressure boundary. For example, the GL indicates that current technical specifications include language that excludes sections of cold leg tubing from inspection extent. The GL also states that the selection of NDE techniques is not specified in the Technical Specifications, but is governed by the provisions of 10CFR Part 50 Appendix B, and as such, are not used to define pressure boundary limits. From an integrity assessment perspective, neither past NRC approval of Alternate Repair Criteria (ARCs) nor the suggested changes to the Technical Specification provided in the GL address or indicate that the basis for approval is a redefinition of the pressure boundary.

2. The NRC endorsed guidance for 10CFR 50.59 evaluations (NEI 96-07) defines "method of evaluation" and the associated 10CFR50.59 screening protocol. Section 4.3.8 of NEI 96-07 states that methods of evaluation that are not described, outlined or summarized in the UFSAR are excluded from departure consideration. The tube integrity assessments employed by SCE consider the entire length of pressure boundary tubing.

Undetected flaws and their impact on tube integrity are addressed. The assessments are consistent with industry standards. The analyses and analysis parameters are not described, outlined or summarized in ASME Section III, ASME Section XI or in the UFSAR, and therefore would not constitute a change/departure in the method of evaluation per 10CFR 50.59.

3. The safety assessment was performed in accordance with the provisions of the EPRI *Steam Generator Integrity Assessment Guidelines* and the structural and accident leakage integrity performance criteria specified in NEI 97-06 and NUREG 1022. This ensures margins of safety consistent with the ASME Section III Code and Regulatory Guide 1.121 and that any potential accident leakage is within safety analysis limits. Notwithstanding the conclusion that the assessment does not constitute a change to the method of evaluation as described in 10CFR50.59, SCE has concluded that the steam generator inspections within the tubesheet region are not consistent with the GL position and a licensing amendment change will be submitted as indicated in response to Question 2.

Attachment 1

Location	Probe	Base Scope	Extent
Full length of tubing	Bobbin	100%	Full Length (except Row 1-3 U-bends and sleeved regions)
Hot leg expansion transition at top of tubesheet	Plus Point	100%	From 4 inches above to 16 inches below the expansion transition
Cold leg top of tubesheet	Plus Point	20%	Cold leg top-of-tubesheet
Cold leg top of tubesheet	Plus Point	100%	Tubes on periphery of tube bundle
U-bend regions of Rows 1, 2, and 3	Plus Point Mid and High Frequency	100%	U-Bend
U-bend regions of Rows 4 through 10	Plus Point Mid Frequency	100%	U-Bend
Dents greater than or equal to 2 volts	Plus Point	100%	Tube support intersection containing dent indication
Dings greater than or equal to 4 volts	Plus Point	100%	Freespan containing ding indication
Quantified wear indications by the bobbin probe	Plus Point	100%	Tube support intersection containing indication
Non-quantified or distorted indications by bobbin probe	Plus Point	100%	Indication
Hot leg scallop bar supports	Plus Point	20%	Scallop bar support with the above adjacent hot leg square bend and the below one support elevation of tubing
Sleeves - (Unit 2 Currently Unit 3 - Future)	Plus Point	100%	Full length of sleeves

Attachment 2 Safety Assessment

To address tube cracking within the tubesheet San Onofre participated in work with other utilities with CE steam generators to define an appropriate inspection depth. This task began under Combustion Engineering Owners Group [CEOG] Task 1154 and evolved by additional work to WCAP-15894-P Revision 0, dated May 2002. A prior submittal that was based on the approved WCAP-15894-P Revision 0 specified an inspection depth of 5 inches of tubing within the tubesheet. This license amendment was submitted by Southern California Edison [SCE to NRC, dated May 22, 2002.] This license amendment was approved by NRC [NRC to SCE, dated June 17, 2002.] The approval was conditional for use for only cycle 12 of operation for San Onofre Unit 2 and for only the balance of the operating cycle 11 for San Onofre Unit 3.

Since that time, additional testing was conducted that concluded the initial data was not conservative due to the type of water used to evaluate leakage. Initially, de-oxygenated de-mineralized water was used in the abandoned Boston Edison tubesheet. These initial results were compared to the most recent test and it was concluded the initial data would be excluded from the dataset.

The current basis for the inspection depth within the tubesheet is WCAP-16208-P, dated October 2004. Based on this assessment, San Onofre Units 2 and 3 needs to inspect a depth of 10.4 inches within the tubesheet. San Onofre inspected 16 inches [minimum] during the two most recent inspections.

To address postulated leakage from the un-inspected portion of the hot leg tubesheet a leakage value was calculated in the WCAP. This leakage estimate was made based on a hypothetical severance of every in-service tube at the lower extent of the inspection depth and this leakage was added to the operational assessment for the full cycle leakage estimate. This additional leakage was added to all other mechanisms and verified to be below the site limit, based on postulated accident conditions.

It was determined that the total leakage was less than the site limit of 0.5 gpm under steam line break conditions.

Since there is no issue with burst (tube being inside the tubesheet), the generators were determined to be operable consistent with the methodology of NEI 97-06.

San Onofre has determined that a license change will be submitted to clarify the inspection definition from the current wording to a value consistent with WCAP-16208P. The license change is not necessary for start up or for continued operation.